

## An annotated checklist of mites (Arachnida: Acari) of Zambia

ENALA T. MWASE<sup>1</sup> & ANNE S. BAKER<sup>2</sup>

<sup>1</sup> Department of Paraclinical Studies, School of Veterinary Medicine, The University of Zambia, Great East Road Campus, P.O. Box 32379, Lusaka, Zambia; E-mail emwase2000@yahoo.com

<sup>2</sup> Department of Entomology, The Natural History Museum, Cromwell Road, London SW7 5BD, UK; E-mail A.Baker@nhm.ac.uk

### TABLE OF CONTENTS

ABSTRACT .....	1
INTRODUCTION .....	2
Notes on the checklist .....	2
Checklist of mites recorded from Zambia .....	3
ORDER ASTIGMATA .....	3
ORDER MESOSTIGMATA .....	5
ORDER ORIBATIDA .....	10
ORDER PROSTIGMATA .....	10
ACKNOWLEDGEMENTS .....	16
REFERENCES .....	16
APPENDIX .....	23

### ABSTRACT

Published literature on the mites of Zambia (formerly Northern Rhodesia) is scanty and fragmentary. As a baseline for further work to enhance knowledge of this fauna, an annotated list of the taxa reported to date is presented. Data for 90 species or incompletely identified species (representing four orders, 42 families and 57 genera) are given. The mites originated from vertebrates, invertebrates, plants, bat guano, house dust and freshwater habitats. Seventeen species are either introduced predators that have evidently not established or are concluded to be incorrect records. A host/habitat–mite checklist is also provided.

**Key words:** Northern Rhodesia, Zambia, mites, checklist, Acari

## INTRODUCTION

Apart from the medically and veterinarily important ticks, the Acari of Zambia (formerly Northern Rhodesia) have not been studied in detail. Published literature on the mite fauna is scarce and fragmentary in its occurrence. Currently, there is no single information source that enables researchers to find out what taxa have been reported to date, where they were found and in which publications the records appear. In Zambia, interest is developing in surveying soil fauna in connection with the reclamation of land formerly used for mining (ETM, personal observation), and data on the mite component will be of considerable importance for these studies. Our research shows that mites of agricultural, veterinary and medical significance have been recorded in Zambia, although these records have never been summarized. It was beyond the scope of this study to establish the accuracy of identifications, but the checklist provides a reference source for other workers and is a preliminary to further studies of Zambian mites planned by the authors. The information is also expected to help stimulate more research activity in Zambia than currently exists, thereby enhancing knowledge of the diversity and significance of this fauna.

The list presented below comprises a total of 90 species, with representatives from four orders, 42 families and 57 genera. However, five of the species are introduced predators that have apparently not become established, while 12 are concluded to have been incorrectly recorded. We did not have access to a complete set of the Government of Zambia reports that were potential sources of records, and this, together with the scattered occurrence of the publications in which information was found, make it likely that some taxa have been missed. The senior author would, therefore, welcome any overlooked records being brought to her attention.

A list of host and habitat associations for Zambian mites is given (Appendix 1).

### Notes on the checklist

The mites are arranged alphabetically by order, as are families within orders, genera within families and species within genera. Each entry appears in the following format:

Species name, author and date (common name/s, if any)

Distribution. Host and/or habitat [as given in source publication]; locality, source publication ([listed] indicates that a publication has repeated a record published elsewhere without giving any additional data). The absence of host/habitat and/or locality data, indicates that none are given in the source publication.

Synonym. Where applicable, and only those appearing in published Zambian records.

Remarks. Any additional information as seen relevant.

## Checklist of mites recorded from Zambia

ZOOTAXA

1106

### ORDER ASTIGMATA

#### FAMILY AVENZOARIIDAE

*Hyonyssus (Hyonyssoides) pleoschizus* Gaud, 1989

Distribution. *Lybius leucocephalus* Defilippi (white-headed barbet) (Piciformes: Capitonidae); (Gaud 1989).

#### FAMILY CYTODITIDAE

*Cytodites nudus* (Vizioli, 1869) (air-sac mite)

Distribution. Poultry; Mazabuka, Southern Province (Department of Animal Health 1934). Poultry; (Department of Animal Health 1932). (Ministry of Rural Development 1972a).

Synonym. *Cytoleichus nudus*, Ministry of Rural Development 1972a: 19; Department of Animal Health 1934: 70.

#### FAMILY GLYCYPHAGIDAE

*Glycyphagus* spp.

Distribution. House dust from sleeping areas; Ndola, Copperbelt Province (Buchanan & Jones 1974).

Synonym. *Glycophagus* spp., Buchanan & Jones 1974: 680, 681.

Remarks. Members of this genus constituted 1.5% of the mites collected.

#### FAMILY KNEMIDOKOPTIDAE

*Knemidokoptes mutans* (Robin & Lanquetin, 1859) (scaly-leg mite of poultry)

Distribution. Poultry, turkey; Mazabuka, Southern Province (Department of Animal Health 1934).

Synonym. *Cnemidocoptes mutans*, Department of Animal Health 1934: 70.

#### FAMILY LAMINOSIOPTIDAE

*Laminosioptes cysticola* (Vizioli, 1869) (fowl cyst mite, flesh mite, subcutaneous mite)

Distribution. (Ministry of Rural Development 1972a).

Remarks. Elsewhere, parasitizes domestic poultry and wild Phasianidae, e.g., the partridge (Fain 1981).

#### FAMILY PSOROPTIDAE

*Psoroptes cuniculi* (Delafond, 1859) (rabbit ear canker mite, rabbit ear mite)

Distribution. *Oryctolagus cuniculus* (Linnaeus) (rabbit) (Lagomorpha: Leporidae); Central Research Laboratory, Balmoral, Lusaka, Lusaka Province (ETM, personal observation). (Ministry of Rural Development 1976).

Remarks. Frequent infestations of rabbits maintained for research at the Central Research Laboratory were experienced in 1984–1987.

*Psoroptes ovis* (Hering, 1838)

Distribution. Cattle; (Department of Animal Health 1933, 1934, Veterinary Department 1936–1940).

Synonym. *Psoroptes bovis* (Gerlach), Department of Animal Health, 1933: 23, 1934: 19; Veterinary Department, 1936: 18, 1937: 28, 1938: 20, 1939: 24, 1940: 16.

*Psoroptes* spp.

Distribution. (Ministry of Rural Development 1972a,b).

Remarks. Psoroptic mange was reported from cattle in Mazabuka, Southern Province (Veterinary Department 1939), from sheep (Veterinary Department 1937) and from unspecified hosts and localities (Department of Veterinary Services 1954, Ministry of Rural Development 1973, 1979).

FAMILY PTERONYSSIDAE

*Anephippius neglectus* Gaud, 1990

Distribution. *Lybius leucocephalus*; (white-headed barbet) (Piciformes: Capitonidae); (Gaud 1990).

FAMILY PYROGLYPHIDAE

*Dermatophagoides pteronyssinus* (Trouessart, 1898) (European house dust mite)

Distribution. House dust from sleeping areas; Ndola, Copperbelt Province (Buchanan & Jones 1974).

Remarks. Constituted 90.4% of the mites collected. Unidentified species of pyroglyphids made up 4.4% of total mites found.

FAMILY SARCOPTIDAE

*Notoedres* sp.

Distribution. (Department of Veterinary Services 1959).

Remarks. Causes mange in small- to medium-sized mammals, e.g., rats, rabbits and cats (Fain 1968).

*Sarcoptes scabiei* (Linnaeus, 1758) (itch mite, sarcoptic mange mite)

Distribution. Cattle, water kudu (sitatunga), hartebeest (Artiodactyla: Bovidae), silver jackal (Carnivora: Canidae); (Department of Animal Health 1934). (Ministry of Rural Development 1973).

Remarks. Sarcoptic mange, or mange, has been regularly reported as a scheduled disease of domesticated animals across Zambia, e.g., pigs (Artiodactyla: Suidae) in

Copperbelt Province (Ministry of Rural Development 1976), goats (Artiodactyla: Bovidae) in Chesikesi and Mazabuka, Southern Province (Chhabra & Kapuma 1991 [abstract only seen]) and unspecified localities (Department of Animal Health 1933), and pigs and goats in Monze and Gwembe districts, Southern Province (Ministry of Lands and Agriculture 1979). Bovine sarcoptic mange was listed in Department of Veterinary Services (1953) and other cases from unspecified hosts and localities in Department of Animal Health (1932), Department of Veterinary Services (1954, 1955), Ministry of Rural Development (1972a–c, 1976, 1979), Ministry of Lands and Agriculture (1979), and Ministry of Agriculture and Water Development (1981, 1986, 1987a,b). In the Samfwa District of Luapula Province, Kalasa *et al.* (2003) reported scabies as one of the ten diseases for which people most often sought treatment.

*Sarcoptes* spp.

Distribution. Central Province (Ministry of Rural Development 1972a). (Department of Veterinary Services 1958, 1959, Ministry of Rural Development 1972b).

FAMILY TURBINOPTIDAE

*Turbinoptes strandtmanni* Boyd, 1949

Distribution. Nasal fossae, *Larus cirrocephalus* Vieillot (grey-headed gull) (Charadriiformes: Laridae); Lochinvar, near Monze, Southern Province (Fain 1960).

ORDER MESOSTIGMATA

FAMILY DERMANYSSIDAE

*Dermanyssus gallinae* (De Geer, 1778)

Distribution. Poultry; (Ministry of Rural Development 1973).

*Dermanyssus* sp.

Distribution. (Ministry of Rural Development 1972a).

FAMILY ENTONYSIDAE

*Hamertonia bedfordi* (Radford, 1937)

Distribution. Lung, *Dendroaspis angusticeps* (Smith) (common green mamba, eastern green mamba, white-mouthed mamba) (Squamata: Elapidae); Mazabuka, Southern Province (Radford 1937, Fain 1961, Zumpt 1961 [listed]).

Synonym. *Entonyesus bedfordi* Radford, 1937: 39.

FAMILY EVIPHIDIDAE

*Eviphis* sp.

Distribution. *Heliocopris hamadryas* (Fabricius) (Coleoptera: Scarabaeidae); (Wiśniewski, 1985).

## FAMILY HALARACHNIDAE

*Pneumonyssoides caninum* (Chandler & Ruhe, 1940) (nasal mite of dog)

Distribution. (Department of Veterinary Services 1956).

Synonym. *Pneumonyssus caninum*, Department of Veterinary Services, 1956: 12.

*Pneumonyssoides potamochoeri* Fain, 1960

Distribution. Nasal fossae, *Potamochoerus porcus* (Linnaeus) (red river hog) (Artiodactyla: Suidae); Lochinvar, near Monze, Southern Province (Fain 1960).

## FAMILY LAELAPIDAE

*Haemolaelaps haydocki* Till, 1959

Distribution. *Thripas namaquus* (Lichtenstein) (bearded woodpecker) (Piciformes: Picidae); Luanshya, Copperbelt Province; near Kafue River, Muliashi Area, Copperbelt Province (Till 1959, Zumpt 1961 [listed]).

*Haemolaelaps phoeniculi* Zumpt & Till, 1954a

Distribution. *Phoeniculus purpureus* (Miller) (green hoopoe, redbilled woodhoopoe) (Upupiformes: Phoeniculidae); (Zumpt 1961).

## FAMILY MACROCHELIDAE

*Macrocheles rhodesi* Evans & Hyatt, 1963

Distribution. *Gymnopleurus azureus* (Fabricius) (Coleoptera: Scarabaeidae); Serenje District, Central Province (Evans & Hyatt 1963).

*Macrocheles sternalis* Evans & Hyatt, 1963

Distribution. *Sceliages augias* Gillet (Coleoptera: Scarabaeidae); (Evans & Hyatt 1963).

## FAMILY MACRONYSSIDAE

*Ornithonyssus bacoti* (Hirst, 1913) (tropical rat mite)

Distribution. Mice (Rodentia: Muridae); Mazabuka, Southern Province (Department of Veterinary Services 1951).

Remarks. The infestations were found in colonies kept for experimental work at the Department.

Synonym. *Liponyssus bacoti*, Department of Veterinary Services, 1951: 10.

*Ornithonyssus lukoschusi* Micherdziński, 1980

Distribution. *Graphiurus murinus* (Smith) (African dormouse, African pygmy dormouse) (Rodentia: Myoxidae); Mumbwa, Central Province (Micherdziński 1980).

*Pellonyssus biscutatus* (Hirst, 1922)

Distribution. Nest, *Campethera abingoni* (Smith) (golden-tailed woodpecker) (Pici-formes: Picidae); Luanshya, Copperbelt Province (Zumpt & Till 1954b).

Synonym. *Steatonyssus biscutatus*, Zumpt & Till 1954b: 54.

Remarks. Zumpt (1961) reported this species as a parasite of the woodpeckers *Dendropicos fuscescens* (Vieillot), *C. abingoni* and *Thripas namaquus* in Zambia, Bechuanaland (now Botswana), Transvaal (South Africa) and Mozambique, but did not indicate whether it had been found on all three hosts in each country.

## FAMILY PHYTOSEIIDAE

*Euseius concordis* (Chant, 1959)

Distribution. *Manihot esculenta* (cassava) (Euphorbiaceae); (Yaninek *et al.* 1993).

Remarks. A species of South American origin, it was released in Zambia in 1987 to control the introduced neotropical cassava green mite *Mononychellus tanajoa* (Bondar) (Prostigmata: Tetranychidae) (Yaninek *et al.* 1993). It, however, was not found in post-release monitoring and has apparently not become established.

*Euseius magucii* (Meyer & Rodrigues, 1966)

Distribution. *Citrus* sp. (Rutaceae); east of Shenge, Southern Province. *Mangifera indica* (mango) (Anacardiaceae); 50 and 100 km southeast of Mporokoso, Northern Province. *Persea americana* (avocado) (Lauraceae); 21 km south of Mwinilunga, Northwestern Province. *Psidium guajava* (guava) (Myrtaceae); 3 km north of Mpika, Northern Province (Moraes *et al.* 2001).

*Euseius myrobalanus* (Ueckermann & Loots, 1988)

Distribution. *Anisofhylla pomiflora* (*sic*); 75 km west of Solwezi, Northwestern Province. *Combretum ghasalense* (Combretaceae); 10 km north of Mansa, Laupula Province. *Combretum molle*, *Piliostigma thonningii* (Caesalpinioideae); 3 km north of Mpika, Northern Province. *Protea gaguedi* (African sugarbush) (Proteaceae); 150 km southwest of Mpika. *Terminalia mollis* (?*Terminalia m.*, Combretaceae); 75 km north of Mpika. Unidentified plant; 7 km south of Mwinilunga, Northwestern Province (Moraes *et al.* 2001).

*Euseius neolokele* Moraes, Ueckermann & Oliveira, 2001

Distribution. *Brachystegia boehmii* (Caesalpinaceae); 84 km south of Kasama, Northern Province (Moraes *et al.* 2001).

*Euseius zambiaensis* Moraes, Ueckermann & Oliveira, 2001

Distribution. *Brachystegia balaerana* (Caesalpinaceae); 100 km southeast of Mporokoso, Northern Province. *Brachystegia boehmii*, *B. spiciformis*; 16 km west of

Mpika, Northern Province. *Brachystegia longifolia*; 50 km east of Mansa, Laupula Province, 100 km southeast of Mporokosa. *Hymenocardia acida* (Hymenocarpaceae); 8 km east of Mwinilunga, Northwestern Province (Moraes *et al.* 2001).

*Galendromus annectens* (De Leon, 1958)

Distribution. *Manihot esculenta* (cassava) (Euphorbiaceae); (Yaninek *et al.* 1993).

Remarks. As for *Euseius concordis*.

*Neoseiulus anonymus* (Chant & Baker, 1965)

Distribution. *Manihot esculenta* (cassava) (Euphorbiaceae); (Yaninek *et al.* 1993).

Remarks. As for *Euseius concordis*, except released in 1984.

*Neoseiulus idaeus* Denmark & Muma, 1973

Distribution. *Manihot esculenta* (cassava) (Euphorbiaceae); (Yaninek *et al.* 1993).

Remarks. As for *Euseius concordis*, except released in 1984, 1989 and 1990.

*Phytoseiulus persimilis* Athias-Henriot, 1957

Distribution. Unknown (Zambia Department of Agriculture 1977 [not seen], reported in Mau & Lee 1994).

Remarks. This species was described from specimens collected in Algeria, but has been introduced into many countries for use in pest management programmes. May have controlled the tomato russet mite *Aculops lycopersici* (Massee) (Prostigmata: Eriophyidae) in Zambia (reported in Mau & Lee 1994).

*Typhlodromalus aripo* De Leon, 1967

Distribution. *Manihot esculenta* (cassava) (Euphorbiaceae); (Kairo *et al.* 2003), Luapula and Northern Provinces (Legg *et al.* 2000).

Remarks. Of South American origin, was introduced into Zambia in 1999–2000 to control the cassava green mite *Mononychellus tanajoa* (Prostigmata: Tetranychidae) (Kairo *et al.* 2003). It is reported to have established in Zambia (Legg *et al.* 2000).

*Typhlodromalus limonicus* (Garman & McGregor, 1956)

Distribution. *Manihot esculenta* (cassava) (Euphorbiaceae); (Yaninek *et al.* 1993).

Remarks. As for *Euseius concordis*, except released in 1989 and 1990.

FAMILY RHINONYSSIDAE

*Larinyssus orbicularis* Strandtmann, 1948

Distribution. *Glareola pratincola* (Linnaeus) (European pratincole, collared pratincole) (Charadriiformes: Glareolidae), *Chlidonias leucoptera* Temminck (white-winged tern) (Charadriiformes: Laridae); Lochinvar Ranch, near Monze, Southern Province (Fain 1960).

*Mesonyssus schoutedeni* (Fain, 1956)

Distribution. Nasal fossae, *Halcyon albiventris* (Scopoli) (brown-hooded kingfisher) (Coraciiformes: Alcedinidae), Lochinvar, near Monze, Southern Province (Fain 1960).

*Rhinonyssus himantopus* Strandtmann, 1951

Distribution. Nasal fossae, *Hoplopterus spinosus* Linnaeus (= *Vanellus spinosus*) (spur-winged plover) (Charadriiformes: Charadriidae); Lochinvar, near Monze, Southern Province (Fain 1960).

*Rhinonyssus rhinolethrum* (Trouessart, 1895)

Distribution. Nasal fossae, *Anas (Nettion) punctatum* Burchell (= *Anas hottentota* (Eyton)) (Hottentot teal) (Anseriformes: Anatidae); Lochinvar, near Monze, Southern Province (Fain 1960).

*Ruandanyssus terpsiphonei* Fain, 1957

Distribution. Nasal fossae, *Campephaga phoenicea* (Latham) (red-shouldered cuckoo-shrike) (Passeriformes: Campephagidae); Lochinvar, near Monze, Southern Province (Fain 1960).

*Sternostoma boydi* Strandtmann, 1951

Distribution. Nasal fossae, *Chlidonias leucoptera* Temminck (white-winged tern) (Charadriiformes: Laridae); Lochinvar, near Monze, Southern Province (Fain 1960).

*Sternostoma francolini* Fain, 1960

Distribution. Nasal fossae, *Francolinus coqui* (Smith) (coqui francolin) (Galliformes: Phasianidae); Lochinvar near Monze, Southern Province (Fain 1960).

## FAMILY SPINTURNICIDAE

*Spinturnix walkerae* Zumpt & Till, 1954a

Distribution. *Pipistrellus nanus* (Peters) (banana bat) (Chiroptera: Vespertilionidae); [probably] Lusaka Province (Pierce 1984).

## FAMILY UROPODIDAE

*Trichouropoda abercorni* Wiśniewski & Hirschmann, 1987

Distribution. Unidentified beetle species (Coleoptera: Scarabaeidae); Abercorn (now Mbala), Northern Province (Hirschmann & Wiśniewski 1987).

*Trichouropoda buettneri* Wiśniewski & Hirschmann, 1988

Distribution. Unidentified beetle species (Coleoptera: Cerambycidae); Lusaka, Lusaka Province (Hirschmann & Wiśniewski 1988).

*Trichouropoda laevis* Wiśniewski & Hirschmann, 1992

Distribution. Unidentified beetle species (Coleoptera: Brenthidae); Broken Hill (now Kabwe), Central Province (Wiśniewski & Hirschmann 1992).

*Trichouropoda zambiae* Wiśniewski & Hirschmann, 1987

Distribution. Unidentified beetle species (Coleoptera: Scarabaeidae); Broken Hill (now Kabwe), Central Province (Hirschmann & Wiśniewski 1987).

## ORDER ORIBATIDA

### FAMILY GALUMNIDAE

*Orthogalumna terebrantis* Wallwork, 1965 (water hyacinth mite)

Distribution. *Eichhornia crassipes* (Mart.) Solm-Laubach (common water hyacinth) (Pontederiaceae); Zambezi River (Julien 2001), Kafue River (Hill 1997).

Remarks. This mite, first discovered in Uruguay (Wallwork 1965), was released in Zambia in 1971 to control *E. crassipes* (Julien 2001). It became widely established (Hill 1997).

## ORDER PROSTIGMATA

### FAMILY ARRENURIDAE

*Arrenurus (Micruracarus) forcipetiolatus* Walter, 1922

Distribution. Lake Nyassa (Jansen van Rensburg 1974 [listed], Viets 1953).

Remarks. The locality given by Viets (1953) does not now fall within Zambian borders. At that time, Lake Nyassa was included in the Central African Federation (also called the Federation of Rhodesia and Nyasaland), which comprised Southern Rhodesia (now Zimbabwe), Northern Rhodesia (now Zambia) and Nyasaland (now Malawi). In 1963, the Federation was dissolved and subsequently Lake Nyassa's western limit lay in the newly independent Malawi.

*Arrenurus (Truncaturus) uncus* Viets, 1972

Distribution. (Jansen van Rensburg 1974).

Remarks. This is a questionable record because Jansen van Rensburg (1974) gives Zambia as the only country in which *A. uncus* occurs, but does not mention the type locality (Salisbury, Southern Rhodesia; now Harare, Zimbabwe) (Viets 1972).

### FAMILY CHEYLETIDAE

*Cheyletus* spp.

Distribution. House dust from sleeping areas; Ndola, Copperbelt Province (Buchanan & Jones 1974).

Remarks. Constituted 3.1% of the mites found.

FAMILY DEMODECIDAE

*Demodex bovis* Stiles, 1892

Distribution. Sanga cow (Artiodactyla: Bovidae); Shibuyunji area, Central Province (Meeus 1998). Cattle; (Department of Animal Health 1933, 1934, Veterinary Department 1936–1940).

Synonym. *Demodex folliculorum* var. *bovis*, Department of Animal Health 1933: 23, 1934: 19; Veterinary Department 1936: 18, 1937: 28, 1938: 20; 1939: 24, 1940: 16.

*Demodex canis* Leydig, 1859

Distribution. Dog; (Department of Animal Health 1934).

*Demodex folliculorum* (Simon, 1842)

Distribution. (Department of Veterinary Services 1956).

*Demodex phylloides* Csokor, 1879

Distribution. Pigs; (Department of Animal Health 1934).

*Demodex* spp.

Distribution. (Department of Veterinary Services 1959, Ministry of Rural Development 1972a & b).

Remarks. The identification of *Demodex*, demodectic or follicular mange is mentioned in Government reports, e.g., Department of Animal Health (1930), Department of Veterinary Services (1954, 1955, 1958) and Ministry of Rural Development (1972a, 1973, 1979). Cases from cattle (Artiodactyla: Bovidae) were reported from Western Province (Ministry of Lands and Agriculture 1979), Livingstone, Choma, Mazabuka, Southern Province, Luangwa, Lusaka Province, Abercorn (now Mbala), Northern Province (Department of Animal Health 1931) and Chilanga, Lusaka Province (Veterinary Department 1929). Bovine and canine demodectic mange from unspecified localities are listed in Department of Veterinary Services (1952), and bovine mange from unspecified localities in Department of Veterinary Services (1951, 1953).

FAMILY EREYNETIDAE

*Coboydaia clavata* (Fain, 1955)

Distribution. Nasal fossae, *Quelea quelea* (Linnaeus) (red-billed quelea) (Passeriformes: Ploceidae); Lochinvar, near Monze, Southern Province (Fain 1960).

Synonym. *Boydaia clavata*, Fain 1960: 101.

## FAMILY ERIOPHYIDAE

*Aculops lycopersici* (Masse, 1937) (tomato russet mite, tomato rust mite)

Distribution. Not known (Zambia Department of Agriculture 1977 [not seen], reported in Mau & Lee 1994).

## FAMILY ERYTHRAEIDAE

*Leptus aggoratus* Haitlinger, 1990

Distribution. Unidentified beetle species (Coleoptera: Tenebrionidae); (Haitlinger 1990).

## FAMILY EYLAIIDAE

*Eylais paski* Soar & Williamson, 1927

Distribution. River mouth on Lake Tanganyika (Jansen van Rensburg 1974 [listed as *Eylais* (?) *paski*], Soar & Williamson 1927, Viets 1953 [listed]).

Remarks. It is unclear why Viets (1953) included *E. paski* in the species list for Zambia when Soar & Williamson (1927) give its distribution as Tanganyika (now Tanzania).

## FAMILY HYDRODROMIDAE

*Hydrodroma despiciens* (Müller, 1776)

Distribution. Lake Tanganyika (Cunnington 1920 [listed], Soar 1910, Viets 1953 [listed]).

Remarks. Viets (1953) acknowledged that the locality data for the species he listed for Zambia were insufficient to be certain of the country of origin. Although the southern limit of Lake Tanganyika falls in Zambia's Northern Province, Cunningham's account of limnological studies of the lake suggests this species was more likely to have been collected from the Tanzanian part (Cunnington 1920, p. 508).

## FAMILY HYGROBATIDAE

*Hygrobatas edentipalpis* Soar, 1910

Distribution. Lake Tanganyika (Cunnington 1920 [listed], Jansen van Rensburg 1974 [listed], Soar 1910, Viets 1953 [listed]).

Remarks. See Remarks for *Hydrodroma despiciens*.

## FAMILY LIMNESIIDAE

*Limnesia campanulata* Koenike, 1895

Distribution. River near Mpika, Northern Province (Jansen van Rensburg 1974 [listed], Viets 1953).

## FAMILY MIDEOPSIDAE

*Mideopsis* (*Octomideopsis*) *minuta* Soar, 1910

Distribution. Lake Tanganyika (Cunnington 1920 [listed], Jansen van Rensburg 1974 [listed], Soar 1910, Viets 1953 [listed]).

Remarks. See Remarks for *Hydrodroma despiciens*.

## FAMILY MYOBIIDAE

*Nycterimyobia nycteris* Fain, 1972a

Distribution. Guano, Microchiroptera; Chipongwe Cave, near Lusaka, Lusaka Province (Fain 1972a, 1978 [listed]).

*Radfordia* (*Graphiurobia*) *graphiuri* Fain, 1972b

Distribution. *Graphiurus murinus* (Smith) (African dormouse, African pygmy dormouse) (Rodentia: Myoxidae); Mumbwa, Central Province (Fain 1978).

## FAMILY OPHIOPTIDAE

*Afrophiotes rhodesiensis* Fain, 1962

Distribution. Under scales and on body, *Cerastes tritaeniatus* (Günther) (Squamata: Colubridae); Abercorn (now Mbala), Northern Province (Fain 1962).

*Ophiotes schoutedeni* Fain, 1962

Distribution. Scales, *Boaedon lineatus* Duméril & Bibron (striped house snake) (Squamata: Colubridae); Abercorn (now Mbala), Northern Province (Fain 1962).

## FAMILY PIONIDAE

*Forelia liliacea* (Müller, 1776)

Distribution. Lake Tanganyika (Cunnington 1920 [listed], Jansen van Rensburg 1974 [listed], Soar 1910, Viets 1953 [listed]).

Remarks. See Remarks for *Hydrodroma despiciens*.

## FAMILY PODAPOLIPIDAE

*Podapolipoides volkonskyi* Husband, 1995

Distribution. Migratory locusts; Abercorn (now Mbala), Northern Province (Husband 1995).

## FAMILY SYRINGOPHILIDAE

*Neoaulobia agapornis* Fain, Bochkov & Mironov, 2000

Distribution. *Agapornis nigrigenis* Sclater (black-masked lovebird) (Psittaciformes: Psittacidae); (Fain *et al.* 2000).

Remarks. The host originated from Zambia, but was later kept in captivity in Antwerp Zoo, Belgium. This mite species was collected after the death of the bird.

## FAMILY TETRANYCHIDAE

*Mononychellus tanajoa* (Bondar, 1938) (cassava green mite)

Distribution. *Manihot esculenta* (cassava) (Euphorbiaceae); (Yaninek & Herren 1988).

Remarks. This mite was suspected to have been introduced into Africa on cassava cuttings imported from Colombia in the early 1970s. Its presence in Zambia was confirmed in 1984 (Yaninek & Herren 1988).

*Tetranychus cinnabarinus* Boisduval, 1867 (carmine spider mite)

Distribution. *Datura stramonium* (Jimsonweed) (Solanaceae); Lusaka, Lusaka Province (Meyer 1974).

Remarks. This species was synonymized with *T. urticae* by Dupont (1979), but is now treated as a distinct species by many authors.

*Tetranychus evansi* Baker & Pritchard, 1960

Distribution. Tomato (Solanaceae); (ICIPE 2004).

Remarks. An important pest of tomato, this species is thought to be of American origin. It was introduced into southern Africa in the 1970s and first recorded in Zambia in about 1985 (ICIPE 2004).

*Tetranychus frater* Wainstein, 1960

Distribution. Tomato (Solanaceae); (Goldsmid 1962).

*Tetranychus lombardii* Baker & Pritchard, 1960

Distribution. *Gossypium* sp. (cotton) (Malvaceae); Mazabuka [cited as Nazabuka], Southern Province (Meyer 1974).

*Tetranychus ludeni* Zacher, 1913

Distribution. *Datura stramonium* (Jimsonweed) (Solanaceae); Lusaka, Lusaka Province (Meyer 1974).

*Tetranychus neocaledonicus* André, 1933

Distribution. Cotton (Malvaceae); Mazabuka, Southern Province (Meyer & Rodrigues 1966). *Thunbergia gibsonii* (orange clock vine) (Acanthaceae); Lusaka, Lusaka Province (Meyer 1974). (Meyer 1987 [listed]).

*Tetranychus urticae* Koch, 1836 (two-spotted spider mite)

Distribution. Tomato (Solanaceae); (Jensen & Mingochi 1988 [not seen]). (Carmona 1968).

Synonym. *Tetranychus telarius* (Linnaeus), Carmona, 1968: 272.

Remarks. Carmona (1968) lists *T. cinnabarinus* as a synonym of *T. telarius*. Both of these species have been synonymized with *T. urticae* (by Dupont (1979) and Smith & Baker (1968) respectively). However, because *Tetranychus cinnabarinus* is now treated as distinct, it is possible that Carmona's material would be identified as this species.

## FAMILY TROMBICULIDAE

*Eutrombicula microps* Lawrence, 1951

Distribution. *Riopa sundevalli* (Smith) (Sundervalls skink) (Squamata: Scincidae); Zambezi River (Lawrence 1951, Zumpt 1961 [listed]).

## FAMILY TYDEIDAE

*Pronematus ubiquitous* (McGregor, 1932)

Distribution. Tomato (Solanaceae); Lusaka, Lusaka Province (Meyer & Rodrigues 1966).

## FAMILY UNIONICOLIDAE

*Encentridophorus spinifer* (Koenike, 1893)

Distribution. Lake Nyassa (Jansen van Rensburg 1974 [listed], Viets 1953).

Remarks. See Remarks for *Arrenurus forcipetiolatus*.

*Neumania soari* Lundblad, 1925

Distribution. Lake Tanganyika (Cunnington 1920 [listed, as *N. papillosa*], Jansen van Rensburg 1974 [listed, as *N. (?) soari*], Soar 1910 [*N. papillosa*], Viets 1953 [listed]).

Remarks. See Remarks for *Hydrodroma despiciens*.

*Unionicola cunningtoni* Soar, 1910

Distribution. Lake Nyassa (Viets 1953).

Remarks. See Remarks for *Arrenurus forcipetiolatus*.

*Unionicola (Pentatax) falcifera* (Daday, 1907)

Distribution. (Jansen van Rensburg 1974).

Remarks. Possibly included in error. It is not listed for Zambia by Viets (1953), and the authors can find no other record of it occurring there.

*Unionicola (Pentatax) figuralis* (Koch, 1836)

Distribution. Lake Tanganyika (Cunnington 1920 [listed], Jansen van Rensburg 1974 [listed], Soar 1910, Viets 1953 [listed]).

Remarks. See Remarks for *Hydrodroma despiciens*.

## Unspecified genus and species

Distribution. *Spongilla nitens* (Porifera: Spongillidae); Lake Bangweolo (alternative spelling, Bangweulu), Laupula/Northern Province (Arndt 1933, 1936, Arndt & Viets 1938, Viets 1953).

## ACKNOWLEDGEMENTS

This work was carried out while the senior author was in receipt of a Commonwealth Fellowship awarded by the Commonwealth Scholarship Commission in the United Kingdom. We are, therefore, most grateful to the Commission for their support and to the Keeper of Entomology, Natural History Museum, London, for hosting the Fellowship.

## REFERENCES

- André, M. (1933) Note sur un Tétranyque nuisible au cotonnier en Nouvelle-Calédonie. *Bulletin du Muséum National d'Histoire Naturelle. Paris* (série 2), 5, 302–308.
- Arndt, W. (1933) Die von Dr. Fritz Haas auf der Schomburgk-Afrika-Expedition 1931/32 gesammelten Süßwasserschwämme. *Senckenbergiana*, 15 (5–6), 302–309.
- Arndt, W. (1936) Die von Dr. A. Monard in Angola gesammelten Süßwasserschwämme. Mit einem Überblick über die Spongillidenfauna Afrikas nach dem gegenwärtigen Stand unserer Kenntnisse. *Arquivos do Museu Bocage*, 7, 7–35.
- Arndt, W. & Viets, K. (1938) Die biologischen (parasitologischen) Beziehungen zwischen Arachnoideen und Spongien. *Zeitschrift für Parasitenkunde, Berlin*, 10(1), 67–93.
- Athias-Henriot, C. (1957) Phytoseiidae et Aceosejidae (Acarina, Gamasina) d'Algérie. I. Genres *Blattisocius* Keegan, *Iphiseius* Berlese, *Amblyseius* Berlese, *Phytoseius* Ribaga, *Phytoseiulus* Evans. *Bulletin de la Société d'Histoire Naturelle de l'Afrique du Nord*, 48, 319–352.
- Baker, E.W. & Pritchard, A.E. (1960) The tetranychoid mites of Africa. *Hilgardia*, 29, 455–574.
- Boisduval, J.B.A.D. de (1867) *Essai sur l'Entomologie Horticole, Comprenant l'Histoire des Insectes Nuisibles à l'Horticulture: et l'Histoire des Insectes et Autres Animaux Utiles aux Cultures*, Paris, 648 pp.
- Bondar, G. (1938) Notas entomológicas da Bahia. III. *Revista de Entomologia, Rio de Janeiro*, 9, 441–445.
- Boyd, E. M. (1949) A new genus and species of mite from the nasal cavity of the ring-billed gull (Acarina, Epidermoptidae). *Journal of Parasitology*, 35, 295–300.
- Buchanan, D.J. & Jones, I.G. (1974) Mites and house dust mite allergy in bronchial asthma in Northern Zambia. *Postgraduate Medical Journal*, 50, 680–682.
- Carmona, M.M. (1968) Contribuição para o estudo de alguns ácaros fitófagos e depredadores, de Angola. *Agronomia Lusitana*, 29, 267–288.
- Chandler, W.L. & Ruhe, D.S. (1940) *Pneumonyssus caninum* n. sp., a mite from the frontal sinus of the dog. *Journal of Parasitology*, 26, 59–67.
- Chant, D.A. (1959) Phytoseiid mites (Acarina: Phytoseiidae). Part I. Bionomics of seven species in southeastern England. Part II. A taxonomic review of the family Phytoseiidae with descriptions of 38 new species. *Canadian Entomologist, Supplement 2*, 1–166.
- Chant, D.A. & Baker, E.W. (1965) The Phytoseiidae of Central America. *Memoirs of the Entomological Society of Canada*, 41, 1–56.

- Chhabra, R.C. & Kapuma, R. (1991) Sarcoptic mange in goats and its control. *Bulletin of Animal Health & Production in Africa*, 39, 411–413. [Abstract only seen]
- Csokor, J. (1879) Ueber Haarsackmilben und eine neue Varietät derselben bei Schweinen, *Demodex phylloides*. *Verhandlungen der Zoologisch-Botanischen Gesellschaft in Wien*, 29, 419–450.
- Cunnington, W.A. (1920) The fauna of the African lakes: a study in comparative limnology with special reference to Tanganyika. *Proceedings of the Zoological Society of London*, 1920, 507–622.
- Daday, E. (1907) Plancton-Tiere aus dem Victoria Nyanza. Sammelausbeute von A. Borgert, 1904–1905. *Zoologische Jahrbücher (Systematik)*, 25, 245–262.
- De Geer, C. (1778) *Mémoires pour servir à l'Histoire des Insectes* 7, Stockholm, p. 111.
- Delafond, H.M.O. (1859) Gale du cheval chez un lapin. *Recueil de Médecine Vétérinaire de l'Ecole d'Alfort*, 36, 74–75.
- De Leon, D. (1958) Four new *Typhlodromus* from southern Florida (Acarina: Phytoseiidae). *Florida Entomologist*, 41, 73–76.
- De Leon, D. (1967) *Some Mites of the Caribbean Area. Part I. Acarina on Plants in Trinidad, West Indies*, Allen Press Inc., Lawrence, Kansas, 66pp.
- Denmark, H.A. & Muma, M.H. (1973) Phytoseiid mites of Brazil (Acarina: Phytoseiidae). *Revista Brasileira Biologia*, 33, 235–276.
- Department of Animal Health (1930) *Government of Northern Rhodesia Department of Animal Health Annual Report for the Year 1929*, Crown Agents, London, 27 pp.
- Department of Animal Health (1931) *Government of Northern Rhodesia Department of Animal Health Annual Report for the Year 1930*, Government Printer, Livingstone, 30 pp.
- Department of Animal Health (1932) *Government of Northern Rhodesia Department of Animal Health Annual Report for the Year 1931*, Government Printer, Livingstone, 44 pp.
- Department of Animal Health (1933) *Government of Northern Rhodesia Department of Animal Health Annual Report for the Year 1932*, Government Printer, Livingstone, 36 pp.
- Department of Animal Health (1934) *Government of Northern Rhodesia Department of Animal Health Annual Report for the Year 1933*, Government Printer, Lusaka, 71 pp.
- Department of Veterinary Services (1951) *Northern Rhodesia Department of Veterinary Services Annual Report for the Year 1950*, Government Printer, Lusaka, 27 pp.
- Department of Veterinary Services (1952) *Northern Rhodesia Department of Veterinary Services Annual Report for the Year 1951*, Government Printer, Lusaka, 24 pp.
- Department of Veterinary Services (1953) *Northern Rhodesia Department of Veterinary Services Annual Report for the Year 1952*, Government Printer, Lusaka, 23 pp.
- Department of Veterinary Services (1954) *Northern Rhodesia Department of Veterinary Services Annual Report for the Year 1953*, Government Printer, Lusaka, 22 pp.
- Department of Veterinary Services (1955) *Northern Rhodesia Department of Veterinary Services Annual Report for the Year 1954*, Government Printer, Lusaka, 19 pp.
- Department of Veterinary Services (1956) *Northern Rhodesia Department of Veterinary Services Annual Report for the Year 1955*, Government Printer, Lusaka, 19 pp.
- Department of Veterinary Services (1958) *Northern Rhodesia Department of Veterinary Services Annual Report for the Year 1957*, Government Printer, Lusaka, 15 pp.
- Department of Veterinary Services (1959) *Northern Rhodesia Department of Veterinary Services Annual Report for the Year 1958*, Government Printer, Lusaka, 16 pp.
- Dupont, L.M. (1979) On gene flow between *Tetranychus urticae* Koch, 1836 and *Tetranychus cinnabarinus* (Boisduval) Boudreaux, 1956 (Acari: Tetranychidae): synonymy between the two species. *Entomologia Experimentalis et Applicata*, 25(3), 297–303.
- Evans, G.O. & Hyatt, K.H. (1963) Mites of the genus *Macrocheles* Latr. (Mesostigmata) associated with coprid beetles in the collections of the British Museum (Natural History). *Bulletin of the British Museum (Natural History) Zoology*, 9, 327–401.

- Fain, A. (1955) Sur le parasitisme des fosses nasals chez les mammifères et les oiseaux par les acar-  
iens de la famille Speleognathidae (Acarina). Description d'une espèce nouvelle chez la  
chauve-souris. *Annales de la Société Belge de Médecine Tropicale*, 35, 689–700.
- Fain, A. (1956) Les Acariens de la famille Rhinonyssidae Vitzthum 1935 parasites des fosses nasals  
des Oiseaux au Ruanda-Urundi (Note préliminaire). *Revue de Zoologie et de Botanique Afric-  
aines*, 53, 131–157.
- Fain, A. (1957) Essai de classification des Rhinonyssidae (Acari: Mesostigmata) avec description  
de deux genres nouveaux. *Annales de Parasitologie Humaine et Comparée*, 32, 145–157.
- Fain, A. (1960) Acariens nasicoles récoltés par le Dr. F. Zumpt en Rhodésie du Nord et au Trans-  
vaal. Description de trois espèces nouvelles. *Revue de Zoologie et de Botanique Africaines*, 62,  
91–102.
- Fain, A. (1961) Les Acariens parasites endopulmonaires des serpents (Entonyssidae: Mesostig-  
mata). *Bulletin Institut royal des Sciences naturelles de Belgique*, 37(6), 1–135.
- Fain, A. (1962) Diagnoses d'Acariens nouveaux. *Revue de Zoologie et de Botanique Africaines*, 66,  
154–162.
- Fain, A. (1968) Etude de la variabilité de *Sarcoptes scabiei* avec une revision des Sarcoptidae. *Acta  
Zoologica Pathologica Antverpiensia*, 47, 3–196.
- Fain, A. (1972a) Myobiidae de l'Angola (Acarina: Trombidiformes). *Publicações Culturais da  
Companhia de Diamantes de Angola*, 86, 13–68.
- Fain, A. (1972b) Diagnoses de nouveaux Myobiidae (Acarina: Trombidiformes). *Revue de Zoolo-  
gie et de Botanique Africaines*, 86, 148–157.
- Fain, A. (1978) Les Myobiidae d'Afrique au sud du Sahara et de Madagascar (Acarina–Prostig-  
mata). *Annales Musée royal de L'Afrique Centrale* (Sciences Zoologiques), 224, 1–186.
- Fain, A. (1981) Notes on the genus *Laminosioptes* Megnin, 1880 (Acari: Astigmata) with descrip-  
tion of three new species. *Systematic Parasitology*, 2, 123–132.
- Fain, A., Bochkov, A. & Mironov, S. (2000) New genera and species of quill mites of the family  
Syringophilidae (Acari: Prostigmata). *Bulletin de l'Institut Royal des Sciences Naturelles de  
Belgique, Entomologie*, 70, 33–70.
- Garman, P. & McGregor, E.A. (1956) Four new predaceous mites (Acarina: Phytoseiidae). *Bulletin  
of the Southern California Academy of Sciences*, 55, 7–13.
- Gaud, J. (1989) Acariens sarcoptiformes plumicoles parasites des oiseaux piciformes d'Afrique. II.  
Acariens de la sous-famille Hyonyssinae (Analgoidea, Avenzoariidae). *Revue de Zoologie  
Africaine*, 103, 229–242.
- Gaud, J. (1990) Acariens sarcoptiformes plumicoles parasites des oiseaux piciformes d'Afrique. III.  
Parasites des Capitonidae et des Picidae - Acariens de la sous-famille Pteronyssinae - genre  
*Anephippius*. *Journal of African Zoology*, 104, 229–239.
- Goldsmid, J.M. (1962) The mites (Acarina) of the Federation of Rhodesia and Nyasaland. *Rhodesia  
Agricultural Journal, Bulletin*, 2162, 1–11.
- Haitlinger, R. (1990) Four new species of *Leptus* (Acari, Prostigmata, Erythraeidae) from tropical  
Africa. *Angewandte Parasitologie*, 31, 29–33.
- Hering, E. (1838) Die Krätzmilben der Thiere und einige verwandte Arten, nach eigenen Untersu-  
chungen beschrieben. *Nova Acta Academiae Caesareae Leopoldino-Carolinae Germanicae  
Naturae Curiosorum*, 18, 573–624.
- Hill, M. (1997) Water hyacinth in Zambia: restoring the balance on the Kafue River. *Plant Protec-  
tion News*, 47, 11–13.
- Hirschmann, W. & Wiśniewski, J. (1987) Gangsystematik der Parasitiformes Teil 498. Weltweite  
Revision der Ganggattung *Trichouropoda* Berlese 1916. VIII. Die *patavina*-Gruppe (Tri-  
chouropodini, Uropodinae). *Acarologie*, 34, 132–177.
- Hirschmann, W. & Wiśniewski, J. (1988) Gangsystematik der Parasitiformes Teil 506. Weltweite  
Revision der Ganggattung *Trichouropoda* Berlese 1916. Neu- und Ergänzungsbeschreibungen

- von *Trichouropoda*-Deutonymphen und *Trichouropoda*-Protonymphen (Trichouropodini, Uropodinae). *Acarologie*, 35, 158–197.
- Hirst, S. (1913) On three new species of gamasid mites found on rats. *Bulletin of Entomological Research*, 4, 119–124.
- Hirst, S. (1922) On some new parasitic mites. *Proceedings of the Zoological Society of London*, 1921, no. 52, 769–802.
- Husband, R.W. (1995) Four new species of *Podapolipoides* (Acari: Podapolipidae), ectoparasitic on grasshoppers (Orthoptera: Acrididae) from Africa. *International Journal of Acarology*, 21(1), 47–61.
- ICIPE (2004) Integrated Management of Red Spider Mites. 2003–2004 International Centre of Insect Physiology and Ecology Highlights. Available from: [http://www.icipe.org/icipe/research\\_areas/plant\\_health/horticultural\\_crop\\_pests/integrated\\_management\\_of\\_red\\_spider\\_mites/](http://www.icipe.org/icipe/research_areas/plant_health/horticultural_crop_pests/integrated_management_of_red_spider_mites/) (15 September 2005).
- Jansen van Rensburg, C.A. (1974) A checklist of the Ethiopian water mites with notes on their distribution. *Wetenskaplike Bydraes van die Potchefstroomse Universiteit vir C.H.O.*, Reeks B, Natuurwetenskappe no.68, 1–51.
- Jensen, A. & Mingochi, D.S. (1988) Chemical control of red spider mite (*Tetranychus urticae* Koch) on tomatoes in Zambia. *Acta Horticulturae*, 218, 275–280.
- Julien, M.H. (2001) Biological control of water hyacinth with arthropods: a review to 2000. In: *Biological and Integrated Control of Water Hyacinth, Eichhornia crassipes*. In: Julien, M.H., Hill, M.P., Center, T.D. & Ding, J. (Eds) *ACIAR Proceedings* 102, 8–20.
- Kairo, M.T.K., Cock, M.J.W. & Quinlan, M.M. (2003) A review article. An assessment of the use of the code of conduct for the import and release of Exotic Biological Control Agents (ISPM No.3) since its endorsement as an international standard. *Biocontrol News and Information*, 24(1), 15N–27N.
- Kalasa, F., Mumba, P., Mulobeka, F., Kambamba, M. & Musamba, C. (2003) Report of the Samfwa District Poverty Reduction Monitoring. Civil Society for Poverty Reduction. Lusaka. 65–89. Available from: [http://www.sarpn.org.za/documents/d0000579/P509\\_PRSP\\_Samfya.pdf](http://www.sarpn.org.za/documents/d0000579/P509_PRSP_Samfya.pdf) (18 October 2005).
- Koch, C.L. (1836) *Deutsche Crustacea, Myriapoda, Arachnida*, fasc I.
- Koenike, F. (1893) Die von Herrn Dr. F. Stuhlmann in Ostafrika gesammelten Hydrachniden des Hamburger naturhistorischen Museums. *Jahrbuch der Hamburgischen Wissenschaftlichen Anstalten*, 10 (1), 1–55.
- Koenike, F. (1895) Hydrachniden. *Deutsch-Ost-Afrika*, 4, 1–18.
- Lawrence, R.F. (1951) New parasitic mites from South African lizards. *Annals of the Transvaal Museum*, 21, 447–459.
- Legg, J., Andrade, M., Cherry, A., Coulibaly, O., Dixon, A., Goergen, G., Hanna, R., James, B., Khizzah, B., Meikle, W., Neuenschwander, P., Teri, J., Toko, M. & Whyte, J. (2000). Integrated Management of Cassava Pests and Diseases. Project 10. Available from: <http://www.iita.org/research/projann2000/IITAproj10-2000.pdf> (15 September 2005).
- Leydig, F. (1859) Über Haarsackmilben und Kratzmilben. *Archiv für Naturgeschichte*, 25, 338–354.
- Linnaeus, C. (1758) *Systema Naturae per Regna Tria Naturae, Secundum Classes, Ordines, Genera, Species, cum Characteribus, Differentiis, Synonymis, Locis*, 10th edition, Holmiae, 824 pp.
- Lundblad, O. (1925) Die systematische Stellung von *Ecpolus papillosus* Soar. *Entomologisk Tidskrift*, 46, 221–224.
- Massee, A.M. (1937) An eriophyid mite injurious to tomato. *Bulletin of Entomological Research*, 28, 403.
- Mau, R.F.L. & Lee, S.G. (1994) Tomato Russet Mite. Available from <http://>

- www.extento.hawaii.edu/kbase/crop/Type/a\_lycope.htm (15 September, 2005).
- McGregor, E.A. (1932) The ubiquitous mite, a new species on citrus. *Proceedings of the Entomological Society of Washington*, 34, 60–63.
- Meeus, P.F.M. (1998) Treatment of bovine demodectosis with closantel. *Veterinary Record*, 143 (16), 451–452.
- Meyer, M.K.P. (Smith) (1974) A revision of the Tetranychidae of Africa (Acari) with a key to the genera of the world. *Entomology Memoir, Department of Agricultural Technical Services, Republic of South Africa*, 36, 1–291.
- Meyer, M.K.P. (Smith) (1987) African Tetranychidae (Acari: Prostigmata) - with reference to the world genera. *Entomology Memoir, Department of Agriculture & Water Supply, Republic of South Africa*, 69, 1–175.
- Meyer, M.K.P. & Rodrigues, M.C. (1966) Acari associated with cotton in Southern Africa (with reference to other plants). *Garcia de Orto*, 13 (2), 1–33.
- Micherdziński, W. (1980) *Eine taxonomische Analyse der Familie Macronyssidae Oudemans, 1936. I. Subfamilie Ornithonyssinae Lange, 1958 (Acarina, Mesostigmata)*. Warszawa & Kraków, Państwowe Wydawnictwo Naukowe, 264pp.
- Ministry of Agricultural and Water Development (1981) *Annual Report of the Department of Veterinary and Tsetse Control Services, Zambia for the Year 1978*, Government Printer, Lusaka, 78 pp.
- Ministry of Agricultural and Water Development (1986) *Annual report of the Department of Veterinary and Tsetse Control Services, Zambia 1984*, Government Printer, Lusaka, 31 pp.
- Ministry of Agricultural and Water Development (1987a) *Annual report of the Department of Veterinary and Tsetse Control Services, Zambia 1983*, Government Printer, Lusaka, 21 pp.
- Ministry of Agricultural and Water Development (1987b) *Annual Report of the Department of Veterinary and Tsetse Control Services, Zambia for the Year 1985*, Government Printer, Lusaka, 32 pp.
- Ministry of Lands and Agriculture (1979) *Annual Report of the Department of Veterinary and Tsetse Control Services, Zambia for the Year 1976*, Government Printer, Lusaka, 33 pp.
- Ministry of Rural Development (1972a) *Annual Report of the Department of Veterinary and Tsetse Control Services, Zambia for the Year 1968*, Government Printer, Lusaka, 27 pp.
- Ministry of Rural Development (1972b) *Annual Report of the Department of Veterinary and Tsetse Control Services, Zambia for the Year 1967*, Government Printer, Lusaka, 24 pp.
- Ministry of Rural Development (1972c) *Annual Report of the Department of Veterinary and Tsetse Control Services, Zambia for the Year 1966*, Government Printer, Lusaka, 19 pp.
- Ministry of Rural Development (1973) *Annual Report of the Department of Veterinary and Tsetse Control Services, Zambia for the Year 1971*, Government Printer, Lusaka, 26 pp.
- Ministry of Rural Development (1976) *Annual Report of the Department of Veterinary and Tsetse Control Services, Zambia for the Year 1973*, Government Printer, Lusaka, 34 pp.
- Ministry of Rural Development (1979) *Annual Report of the Department of Veterinary and Tsetse Control Services, Zambia for the Year 1975*, Government Printer, Lusaka, 31 pp.
- Moraes, G. J. de, Ueckermann, E. A., Oliveira, A. R. & Yaninek, J. S. (2001) Phytoseiid mites of the genus *Euseius* (Acari: Phytoseiidae) from Sub-Saharan Africa. *Zootaxa*, 3, 1–70.
- Müller, O.F. (1776) *Zoologiae Danicae Prodromus, seu Animalium Daniae et Norvegiae Indigenarum Characteres, Nomina, et Synonyma Imprimis Popularium*, Havniae, 282 pp.
- Pierce, M.A. (1984) Parasites of Chiroptera in Zambia. *Journal of Wildlife Diseases*, 20, 153–154.
- Radford, C.D. (1937) A new species of mite of the genus *Entonyssus* Ewing. *The North Western Naturalist*, March, 38–42.
- Robin, C. & Lanquetin (1859) Mémoire sur une nouvelle espèce *Sarcoptes*, parasite des Gallinacés. *Compte Rendu de l'Académie des Sciences*, 49, 793–795.
- Simon, G. (1842) Über eine in den kranken und normalen Haarsacken des menschen lebenden Mil-

- ben. *Archiv für Anatomie, Physiologie und Wissenschaftliche Medizin*, 9, 218–237.
- Smith, F.F. & Baker, E.W. (1968) Names of the two-spotted spider mite and the carmine spider mite to be redesignated. *Co-operative Economic Insect Report, U.S. Department of Agriculture*, 18, 1080.
- Soar, C.D. (1910) A contribution to the list of Hydrachnidae found in the East African lakes. *Journal of the Quekett Microscopical Club*, series 2, 11, 109–114.
- Soar, C.D. & Williamson, W. (1927) A new species of *Eylais* from Tanganyika. *Journal of the Quekett Microscopical Club*, series 2, 15, 331–332.
- Stiles, C. W. (1892) On *Demodex folliculorum* var. *bovis* in American cattle. *Canadian Entomologist*, 24, 286–290.
- Strandtmann, R.W. (1948) The mesostigmatic nasal mites of birds. I. Two new genera from shore and marsh birds. *Journal of Parasitology*, 34, 505–514.
- Strandtmann, R.W. (1951) The mesostigmatic nasal mites of birds. II. New and poorly known species of Rhinonyssidae. *Journal of Parasitology*, 37, 129–140.
- Till, W.M. (1959) Three new *Haemolaelaps* species (Acarina: Laelaptidae) from birds in the Ethiopian region, and a redescription of *Haemolaelaps mesopicos* Radford. *Journal of the Entomological Society of South Africa*, 22, 423–435.
- Trouessart, E. (1895) Note sur un Acarien parasite des fosses nasals de l'oie domestique (*Sternostomum rhinolithrum*). *Revue des Sciences Naturelles Appliquées*, 42, 392–394.
- Trouessart, E. (1898) In: Berlese, A. *Acari, Myriopoda et Scorpiones hucusque in Italia reperta*, Padova Part 92, nr 3.
- Ueckermann, E.A. & Loots, G.C. (1988) The African species of the subgenera *Anthoseius* De Leon and *Amblyseius* Berlese (Acari: Phytoseiidae). *Entomology Memoirs. Department of Agriculture and Water Supply Republic of South Africa*, 73, 1–168.
- Veterinary Department (1929) *Government of Northern Rhodesia Veterinary Department Annual Report for the Year 1928*, Government Printer, Livingstone, 24 pp.
- Veterinary Department (1936) *Government of Northern Rhodesia Veterinary Department Annual Report for the Year 1935*, Government Printer, Lusaka, 35 pp.
- Veterinary Department (1937) *Government of Northern Rhodesia Veterinary Department Annual Report for the Year 1936*, Government Printer, Lusaka, 76 pp.
- Veterinary Department (1938) *Government of Northern Rhodesia Veterinary Department Annual Report for the Year 1937*, Government Printer, Lusaka, 70 pp.
- Veterinary Department (1939) *Government of Northern Rhodesia Veterinary Department Annual Report for the Year 1938*, Government Printer, Lusaka, 60 pp.
- Veterinary Department (1940) *Government of Northern Rhodesia Veterinary Department Annual Report for the Year 1939*, Government Printer, Lusaka, 21 pp.
- Viets, K. (1953) Die aus Afrika bekannten Wassermilben (Hydrachnellae, Acari). *Hydrobiologia*, 5, 1–178.
- Viets, K.O. (1972) Eine neue *Arrenurus*-Art aus Südrhodesien (Hydrachnellae, Acari). *Zoologischer Anzeiger*, 188, 447–452.
- Vizioli, F. (1869) Osservazioni microscopiche sopra alcuni noduli sotto-cutanei dei polli, e descrizione di un nuovo genere di Acaridei parassita degli uccelli. *Giornale di anatomia, fisiologia e patologia degli animali, Pisa*, 1(5), 257–271.
- Wainstein, B.A. (1960) Tetranychoid mites of Kazakhstan (with revision of the family). *Kazakhskaya Akademiya Sel'skokhozyaistvennykh Nauk. Nauchno-Issledovatel'skii Institut Zashchity Rastenii.Trudy*, 5, 1–276. [in Russian]
- Wallwork, J.A. (1965) A leaf-boring mite (Acari: Cryptostigmata) from Uruguay. *Acarologia*, 7, 758–764.
- Walter, C. (1922) Zoologische Resultate der Reise von Dr. P. A. Chappuis an den oberen Nil. II. Hydracarina. *Revue Suisse de Zoologie*, 30, 63–86.

- Wiśniewski, J. (1985) Neue Milbenarten-gefunden in Sammlungen exotischer Käfer. *Mikrokosmos*, 74, 334–336.
- Wiśniewski, J. & Hirschmann, W. (1992) Gangsystematik der Parasitiformes. Teil 541. Zehn neue *Trichouropoda*-Deutonymphen aus Polen, Sowjetunion, Laos, Sambia, Brasilien, Guatemala (Trichouropodini, Uropodinae). *Acarologie*, 39, 141–156.
- Yaninek, J.S. & Herren, H.R. (1988) Introduction and spread of the cassava green mite, *Mononychellus tanajoa* (Bondar) (Acari: Tetranychidae), an exotic pest in Africa and the search for appropriate control methods: a review. *Bulletin of Entomological Research*, 78, 1–13.
- Yaninek, J.S., Onzo, A. & Ojo, J.B. (1993) Continent-wide releases of neotropical phytoseiids against the exotic cassava green mite in Africa. *Experimental & Applied Acarology*, 17, 145–160.
- Zacher, F. (1913) Untersuchungen über Spinnmilben. *Mitteilungen der Kaiserliche Biologischen Anstalt für Land- und Forstwirtschaft*, 14, 37–41.
- Zambia Department of Agriculture (1977) Control of Russet Mite. *Annual Report Research Branch*, 1971–1972, 1–287. Not seen; information obtained from Mau, R.F.L. & Lee, S.G. (1994).
- Zumpt, F. (in collaboration with Audy, J.R., Gaud, J., Lawrence, R.F., Theiler, G., Till, W.M. & Ver-cammen-Grandjean, G. P.) (1961) The arthropod parasites of vertebrates in Africa south of the Sahara (Ethiopian Region). Volume 1 (Chelicerata). *Publications of the South African Institute for Medical Research*, No. 1 (Volume 9), 1–457.
- Zumpt, F. & Till, W.M. (1954a) Four new bloodsucking mites from the Ethiopian region (Acarina: Laelaptidae and Spinturnicidae). *Revista Ecuatoriana de Entomologia y Parasitologia*, 2, 209–218.
- Zumpt, F. & Till, W.M. (1954b) The genus *Steatonyssus* Kolenati in the Ethiopian Region (Acarina: Laelaptidae). *Journal of the Entomological Society of Southern Africa*, 17, 47–57.

**APPENDIX 1.** Summary of host/habitat associations of mites reported to occur in Zambia (A = Astigmata; M = Mesostigmata; O = Oribatida; P = Prostigmata; \* = incorrect/questionable record; † = introduced Phytoseiidae (not established), ‡ = introduced Phytoseiidae (established))

## INVERTEBRATE HOSTS

### Beetles (Coleoptera)

*Gymnopleurus azureus*: *Macrocheles rhodesi* (M)

*Heliocopriss hamadryas*: *Eviphis* sp. (M)

*Sceliages augias*: *Macrocheles sternalis* (M)

Brenthidae (unidentified sp.): *Trichouropoda laevis* (M)

Cerambycidae (unidentified sp.): *Trichouropoda buettneri* (M)

Scarabaeidae (unidentified spp.): *Trichouropoda abercorni*, *Trichouropoda zambiae* (M)

Tenebrionidae (unidentified sp.): *Leptus aggoratus* (P)

**Migratory locusts (Orthoptera):** *Podapolipoides volkonskyi* (P)

### Sponges (Porifera)

*Spongilla nitens* (Spongillidae): *Unionicolidae* sp. (P)

## VERTEBRATE HOSTS

### Birds (Aves)

*Agapornis nigrigenis*: *Neoaulobia agapornis* (P)

*Anas (Nettion) punctatum* (= *Anas hottentota*): *Rhinonyssus rhinolethrum* (M)

*Campophaga phoenicea*: *Ruandanyssus terpsiphonei* (M)

*Campethera abingoni*: *Pellonyssus biscutatus* (M)

*Chlidonias leucoptera*: *Larinyssus orbicularis*, *Sternostoma boydi* (M)

*Fringilla coqui*: *Sternostoma francolini* (M)

*Glareola pratincola*: *Larinyssus orbicularis* (M)

*Halcyon albiventris*: *Mesonyssus schoutedeni* (M)

*Hoplopterus spinosus* (= *Vanellus spinosus*): *Rhinonyssus himantopus* (M)

*Larus cirrocephalus*: *Turbinoptes strandtmanni* (A)

*Lybius leucocephalus*: *Hyonyssus pleoschizus*, *Anephippius neglectus* (A)

*Phoeniculus purpureus*: *Haemolaelaps phoeniculi* (M)

Poultry: *Cytodites nudus*, *Knemidokoptes mutans* (A); *Dermanyssus gallinae* (M)

*Quelea quelea*: *Coboydaia clavata* (P)

*Thripas namaquus*: *Haemolaelaps haydocki* (M)

Turkey: *Knemidokoptes mutans* (A)

### Reptiles (Reptilia)

*Boaedon lineatus*: *Ophiotes schoutedeni* (P)

*Cerastes tritaeniatus*: *Afrophiotes rhodesiensis* (P)

*Dendroaspis angusticeps*: *Hamertonia bedfordi* (M)

*Riopa sundevalli*: *Eutrombicula microps* (P)

### Mammals (Mammalia)

Cattle: *Psoroptes ovis*, *Sarcoptes scabiei* (A); *Demodex bovis*, *Demodex* spp. (P)

Dog: *Demodex canis* (P)

*Graphiurus murinus*: *Ornithonyssus lukoschusi* (M), *Radfordia graphiuri* (P)

Hartebeest: *Sarcoptes scabiei* (A)

Mouse: *Ornithonyssus bacoti* (M)  
*Oryctolagus cuniculus*: *Psoroptes cuniculi* (A)  
 Pig: *Demodex phylloides* (P)  
*Pipistrellus nanus*: *Spinturnix walkerae* (M)  
*Potamochoerus porcus*: *Pneumonyssoides potamochoeri* (M)  
 Silver jackal: *Sarcoptes scabiei* (A)  
 Water kudu (sitatunga): *Sarcoptes scabiei* (A)

#### Unspecified

*Laminosioptes cysticola*, *Notoedres* sp., *Psoroptes* spp., *Sarcoptes* spp. (A); *Dermanyssus* sp., *Pneumonyssoides caninum* (M); *Demodex folliculorum*, *Demodex* spp. (P)

#### PLANT HOSTS

*Anisofhylla pomiflora* [sic]: *Euseius myrobalanus* (M)  
*Brachystegia balaerana*: *Euseius zambiaensis* (M)  
*Brachystegia boehmii*: *Euseius neolokele*, *E. zambiaensis* (M)  
*Brachystegia longifolia*: *Euseius zambiaensis* (M)  
*Brachystegia spiciformis*: *Euseius zambiaensis* (M)  
*Citrus* sp.: *Euseius magucii* (M)  
*Combretum ghasalense*: *Euseius myrobalanus* (M)  
*Combretum molle*: *Euseius myrobalanus* (M)  
*Datura stramonium*: *Tetranychus cinnabarinus*, *T. ludeni* (P)  
*Eichhornia crassipes*: *Orthogalumna terebrantis* (O)  
*Gossypium* sp.: *Tetranychus lombardini*, *T. neocaledonicus* (P)  
*Hymenocardia acida*: *Euseius zambiaensis* (M)  
*Mangifera indica*: *Euseius magucii* (M)  
*Manihot esculenta*: *Euseius concordis*, *Galendromus annectens*, *Neoseiulus anonymus*, *N. idaeus*, *Typhlodromalus limonicus* (†, M); *Typhlodromalus aripo* (†, M); *Mononychellus tanajoa*, *Tetranychus evansi* (P)  
*Persea americana*: *Euseius magucii* (M)  
*Piliostigma thonningii*: *Euseius myrobalanus* (M)  
*Protea gaguedi*: *Euseius myrobalanus* (M)  
*Psidium guajava*: *Euseius magucii* (M)  
 Tomato: ?*Phytoseiulus persimilis* (†, M); ?*Aculops lycopersici*, *Tetranychus evansi*, *T. frater*, *T. urticae*, *Pronematus ubiquitus* (P)  
*Termina mollis* [sic]: *Euseius myrobalanus* (M)  
*Thunbergia gibsonii*: *Tetranychus neocaledonicus* (P)  
 Unidentified: *Euseius myrobalanus* (M)

#### FRESHWATER

*Arrenurus* (*Micruracarus*) *forcipetiolatus*\*, *A. (Truncaturus) uncus*\*, *Eylais paski*\*, *Hydrodroma despiciens*\*, *Hygrobates edentipalpis*\*, *Limnesia campanulata*, *Mideopsis* (*Octomideopsis*) *minuta*\*, *Forelia liliacea*\*, *Encentridophorus spinifer*\*, *Neumania soari*\*, *Unionicola cunningtoni*\*, *U. (Pentatax) falcifera*\*, *U. (P.) figuralis*\* (P).

#### GUANO (MICROCHIROPTERA)

*Nycterimyobia nycteris* (P)

#### HOUSE DUST

*Dermatophagoides pteronyssinus*, unidentified pyroglyphid spp., *Glycyphagus* spp. (A); *Cheyletus* spp. (P)